U.S. DEPARTMENT OF ENERGY
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
OFFICE OF QUALITY ASSURANCE

AUDIT REPORT M&O-ARP-99-002

OF THE

CIVILIAN RADIOACTIVE WASTE MANAGEMENT SYSTEM
MANAGEMENT AND OPERATING CONTRACTOR

AT

LAS VEGAS, NEVADA
And
ALBUQUERQUE, NEW MEXICO

MAY 3 THROUGH MAY 14, 1999

Prepared by: _____ Date: _____
Kenneth O. Gilkerson
Audit Team Leader
Office of Quality Assurance

Approved by: _____ Date: _____
Robert W. Clark
Acting Director
Office of Quality Assurance

1.0 EXECUTIVE SUMMARY

This performance-based Quality Assurance (QA) audit was conducted on the processes and activities related to Total-System Performance Assessment (TSPA) at the Civilian Radioactive Waste Management System Management and Operating Contractor (CRWMS M&O) Offices in Las Vegas, Nevada, May 3 through May 7,1999, and at the Sandia National Laboratories (SNL) offices in Albuquerque, New Mexico, May 10 through May 12, 1999. The purpose of the audit was to evaluate the effectiveness of TSPA to provide evidence of the proposed repository's ability to meet regulatory safety criteria as well as provide input to the repository design process and site characterization activities in accordance with project requirements.

The audit team determined that the CRWMS M&O has effectively implemented critical process steps relative to the TSPA activities evaluated. See Section 2.0. Based on reviews of in-process documentation, interviews of personnel, and examination of procedures, the audit team determined that TSPA activities being conducted at this time meet Office of Civilian Radioactive Waste Management (OCRWM) QA program requirements. It should be noted that while the process activities were evaluated to the extent possible relative to Site Recommendations (SR), some work supporting Viability Assessment (VA) was examined in order to understand the processes being utilized. Although completed SR products were not available at this time, the audit team believes that TSPA has the capabilities, resources, and effective processes necessary to produce acceptable products. The audit team determined that the TSPA management and integration of TSPA activities were excellent.

The audit team identified one deficiency and five recommendations. Deficiency Report (DR) LVMO-99-D-053 was issued to identify implementation deficiencies regarding procedure AP3.10Q, *Analyses and Models*. Details of these deficient conditions adverse to quality are presented in Section 5.5.2 of this report. Also as a result of the audit, five recommendations are provided. These recommendations are detailed in Section 6.0 of this report.

2.0 SCOPE

The audit was conducted through an assessment of processes and related reports (i.e., calculations, analyses) to evaluate the effectiveness of TSPA in providing evidence of the proposed repository's ability to meet regulatory safety criteria as well as provide input to the repository design process and site characterization activities in accordance with project requirements. The following processes and products were examined as part of this audit:

- The model/abstraction workshop process from planning and preparation through conduct and documentation of discussions and results, and, finally implementation of decisions made.
- Processes related to the abstraction analyses of the following models: Saturated Zone (SZ) Flow and Transport, Unsaturated Zone (UZ) Flow and Transport, Disruptive Events, Biosphere and Waste Package Degradation.
- TSPA activities related to License Application Design Selection (LADS)
- Documentation for implementing abstractions, assumptions, default numbers, and reviews used for performance assessment calculations based on the original and commercial RIP software
- TSPA Peer Review results were examined relative to the effectiveness of TSPA processes and products.
- Additionally, the TSPA transition plan was examined to status the progress and accomplishments relative to the process laid out in the plan for implementing the QA program.

The audit team conducted personnel interviews and reviews of documentation in accordance with the approved audit plan to evaluate the adequacy and effectiveness of critical process steps and management objectives for TSPA.

2.1 Process Steps/Products/Documentation

The performance-based evaluation of process effectiveness was based upon the following:

1. Satisfactory completion of critical process steps;
2. Documentation that substantiates the quality of data;
3. Performance of trained and qualified personnel; and
4. Implementation of applicable QA program elements.

The following critical process steps were considered during the evaluations of the TSPA processes and associated products:

- Identification of TSPA goals and objectives
- Regulatory requirements:
  identification of U.S. Nuclear Regulatory Commission (NRC) safety criteria; U.S. Environmental Protection Agency (EPA), Department of Energy (DOE), and other regulatory requirements
- Planning
- Resources:
  1) Prerequisites
  2) Management: structure, communications process, feedback
  3) Logistical

4) Personnel: Use of knowledgeable, capable, competent individuals; qualification requirements
5) Equipment/Materials (i.e. software programs)

- Methodology
  1) Protocols (instructions, procedures, scientific notebooks)
  2) Assumptions/scoping
  3) Gathering of information/data acquisition
  4) Assimilation, categorization, data reduction
  5) Analyses, modeling
  6) Products: models, reports, design input
- Adequacy & Accuracy
  1) Reviews (internal & external)
  2) Evaluations
- Interfaces
  1) Internal (science, engineering, DOE line)
  2) External (NRC)
- Deliverables:
  1) Scientific Investigations (i.e. models)
  2) Design (engineering inputs)
  3) Analyses/reports
  4) Record submittals

2.2 Technical Areas

The audit included a technical evaluation of the adequacy and effectiveness of the TSPA processes and products. Details of the technical evaluation are documented in Section 5.4 of this report.

3.0 AUDIT TEAM AND OBSERVERS

Name/Title/Organization

Kenneth O. Gilkerson, Audit Team Leader, Office of Quality Assurance (OQA)
Kristi A. Hodges, Auditor, OQA
James Blaylock, Auditor, OQA
Jefferson McCleary, Technical Specialist, URSG Woodward-Clyde Federal Services
F. Harvey Dove, Technical Specialist, Golder Associates

There were three observers present at the audit:
William Belke, NRC, Las Vegas, Nevada
Jim Firth, NRC, Washington D.C.
Susan Zimmerman, Nuclear Waste Office, State of Nevada

4.0 AUDIT MEETINGS AND PERSONNEL CONTACTED

A pre-audit meeting was conducted at the CRWMS M&O Offices, Las Vegas, Nevada, on May 3, 1999. Daily debriefings were held, to apprise the CRWMS M&O management and staff, of the progress of the audit and of any identified conditions adverse to quality. A post-audit meeting was conducted at the CRWMS M&O Offices, Las Vegas, Nevada, on May 14, 1999.

Personnel contacted during the audit, including those that attended pre-audit and post-audit meetings, are listed in Attachment 1.

5.0 SUMMARY OF RESULTS

5.1 Program Effectiveness

The audit team concluded that critical process steps applicable to the TSPA processes were effectively implemented. However, a deficiency (DR LVMO-99-D-053) was issued to identify implementation deficiencies regarding procedure AP3.10Q. Details of these deficient conditions adverse to quality are presented in Section 5.5.2 of this report. A recommendation to develop a document that flowcharts and describes the overall performance assessment processes was also made. See Section 6.0 recommendation number one. A number of past TSPA issues had been self-identified in a Management and Operations (M&O) vertical slice evaluation of Performance Assessment (PA) activities and a Transition Plan was developed for PA. A recommendation was made relative to closing out this Transition Plan and addressing these past concerns. See Section 6.0 recommendation number five.

5.2 Stop Work or Immediate Corrective Actions Taken

There were no Stop Work Orders or immediate corrective actions taken as a result of the audit.

5.3 QA Program Activities

A summary table of audit results is provided in Attachment 2. Details of the audit, including the objective evidence reviewed, are documented in the audit checklist. The checklist is maintained as a QA record.

5.4 Technical Audit Activities

Overview
Technical audit activities for this performance-based audit were conducted at M&O Contractor facilities located in both Las Vegas, Nevada, and Albuquerque, New Mexico, by a team of three OQA auditors and two technical specialists. The TSPA effort is comprised of individuals from M&O and teaming members that reside at different geographical locations. The organization is well integrated and appears to work as a cohesive unit. Explanations of the process leading to the TSPA-SR were consistent from the individuals interviewed; personnel were knowledgeable and familiar with the controlling procedures.

The TSPA is transitioning from the VA performed last year to the SR due next year. At the time of the audit, there were no final, approved products.

Technical Audit Activities
This section is a consolidated presentation of the audit team's activities. Eight technical areas of the PA operations were addressed using an audit checklist; they were:

- Assumptions, Software, and Data,
- Abstraction of the Waste Package Degradation Model,
- Abstraction of the Biosphere Model,
- Implementation Documentation for the Repository Integration Program (RIP),
- Abstraction of the UZ Flow and Transport Model,
- Treatment of Future Climate Change by TSPA,
- The Model/Abstraction Workshop Process, and
- Incorporation of Disruptive Events in the TSPA.

In addition, technical questions concerning the Abstraction of the SZ Flow and Transport Model were developed during the audit and discussed in detail at SNL in Albuquerque. These questions related to the diverse sets of information contained in the radionuclide breakthrough curves abstracted for use in the TSPA for the VA of Yucca Mountain. Similar concerns evolved for the Finite Element Heat and Mass (FEHM) and SZ_CONVOLUTE codes imbedded in the RIP software.

Seventeen members of the PA team were interviewed in the two-week period. They were knowledgeable managers and technical staff, who demonstrated competence in the PA operations over which they were responsible. Each PA team member was aware of their specific job requirements and their important communication interfaces necessary to conduct successful operations with other PA staff, often at distant locations.

Responses to checklist questions were supported by objective evidence as

appropriate for clarification and documentation; since quality affecting work for the SR has no completed products, responses by interview were common. Data tracking numbers (DTN) were selected and traced through the documentation as objective evidence of PA operations at various stages in a sequential analysis. Selected DTNs were accessed using personal computers terminals and traced electronically as a real time demonstration of the Technical Data Management System (TDMS). This traceability was to the referenced DTN to confirm that it resided in the TDMS. Traceability of data was not established to the data source.

TSPA consists of three levels of products; AP3.10Q analyses which feed into the process models and in turn feed into the TSPA. At the lowest level, there are two AP 3.10Q analyses in draft stage. By its nature, TSPA will input developed data and output only developed data. All data inputs used by the analysts and modelers must be able to be referenced to a DTN. The analyst/modeler is responsible for assuring the data is appropriate, traceable to a DTN, and suitable for the product being generated. Hence, data traceability extended only to the DTN, not the data source. The data traceability to its source is an open issue that is being addressed under Corrective Action Report (CAR) 99-C-001. Outputs from analyses and process models are considered developed data to be submitted to TDMS.

The current procedure YAP-SIII.3Q, *Processing Data on the Yucca Mountain Project*, recognizes preliminary data by definition, but the procedure provides no procedural method for control of its use. Such data is being used once a DTN has been assigned. It then becomes the user's responsibility to assure the validity of the DTN and its content once accepted into the TDMS. The preliminary data issue is being addressed by the M&O's Process Validation and Re-engineering efforts.

A portion of the PA activity used for the LADS was reviewed as an example of current operations (see checklist questions 25, 26, and 27). The LADS effort was a work in process, but the review demonstrated that the PA team was operating in a controlled environment during the preparation of supporting analyses needed for project design activities. Specifically, M&O procedure QAP-3-12, *Transmittal of Design Input,* was used extensively and appropriately for exchanging information with design.

The PA team was focused toward implementing work scope for SR, and completed work products were not yet available. The audit used existing PA objective evidence for the preparation of the VA to document the extensive information input to the RIP software. In addition, the "Baseline Documentation," prepared under the M&O procedure NLP 3-27, *Engineering*

Calculations, and supported by the Technical Basis Document (TBD) contained a record of the RIP input for the VA.

The audit allowed a cross-section of the PA team to be interviewed and helped to establish credibility in the new procedure AP 3.10Q documentation as underpinning for the Process Model Reports (PMR). At the time of the audit, none of the AP 3.10Q documents had been completed, although two of the analyses were in the draft approval stage. The PMRs provide technical details for the model abstractions that provide a basis for the TSPA-SR. Members of the PA team were well trained in the process leading to the SR. The audit found an integrated PA operation of technical staff and managers from different M&O organizations jointly contributing to site characterization, repository design issues, and regulatory safety criteria in accordance with project requirements.

Review of thirteen "Work Direction and Planning Documents" developed in accordance with AP-3.10Q indicated that there is a procedural non-compliance problem relative to the implementation of section 5.1 of the procedure (see checklist question 66). This deficiency, which concerns planning documents including provisions for determining the accuracy, precision, and representativeness of results, is discussed in detail in section 5.5.2 of this audit report. While this problem requires correction, the overall planning process appears to be sound, both for the individual AP-3.10Q analyses and for the PMRs that they will support.

Documentation of the input information used in the RIP model for the TSPA-VA was excellent at the summary level, but it tended to become incomplete as one proceeded into the more-detailed supporting levels. The "Baseline Documentation" for the VA was supported by the TBD; however, references to further support construction of Probability Distribution Functions (PDF) in the TBD were absent in the cases selected for review. These supporting details add the necessary credibility to the summary statements.

One example of the need for further documentation was the Distribution of Juvenile Failures. This PDF could be successfully traced from the Baseline Document (B00000000-01717-0210-00011 Rev. 01, December 1998) to Chapter 11 of the TBD. The PDF range of juvenile failures was listed as 0.001 percent to 0.1 percent (Section 11.2.4, page 11-14, last paragraph). No further discussion illuminating the basis for this two order-of-magnitude selection was found, nor any references supporting the range was listed in the TBD. Uncertainty attached to this range of numbers was absent, and any consideration of alternate conceptual models for juvenile failures was not mentioned.

The use of individual radionuclide breakthrough curves as DTN inputs to the RIP code may introduce transparency and traceability issues into the TSPA analysis. These curves represent composite analyses that contain combinations of parameters such as dilution factor, rock hydraulic conductivities, groundwater gradients, rock effective porosities, radionuclide retardation coefficients, water chemistry, and rock mineralogy. Available data and various conceptual flow models describing water movement through porous materials or rock fracture networks influence the values placed on these parameters. If information such as basic assumptions, underlying analyses, and uncertainties are not transferred with the DTN composite, a sense of reasonable assurance in the model results may be made more difficult.

Time steps, developed during the operation of the RIP software following a convergence in solution, are not recorded if they are different from the initial input conditions. This clouds the traceability associated with documentation of the input attached to a feature, event, or process (FEP) analyzed by the TSPA. The final time steps used in the RIP analysis may be neither traceable nor transparent to an independent reviewer. This lack of documentation may also affect the sense of reasonable assurance in TSPA model results.

Three PA process concerns were identified during the conduct of the audit and are referenced in recommendations 2, 3, and 4 in Section 6.0; they are:

1. **Imbedded Codes**. At least two major computer codes are imbedded in the RIP software; they are FEHM and SZ_CONVOLUTE. These have the potential of introducing transparency and traceability issues associated with key assumptions, quality of data, conceptual models, and uncertainties that are not visible to the next level of TSPA user. For example, radionuclide breakthrough curves, associated with flow and transport in the saturated zone, reflect the selection of dilution factors that may be the result of expert elicitation and not based on actual field tests. This raises the question as to how the next level user knows that the assumptions, analyses, data quality, and uncertainty contained in the current DTN input are valid for their current application.

2. **Levels of Uncertainty**. The current method of providing a mean and standard deviation of dose to a receptor based on a Monte Carlo or other sampling technique does not adequately describe the system uncertainties contained in the TSPA model. For example, the level of uncertainties contained in the parameter values, conceptual models, and model generated data (such as data sets derived by weighted inverse analyses in the unsaturated zone) are currently not propagated through the system as computational errors.

3. **Key Assumptions**. A master list of key assumptions and their level of impact to the TSPA analysis would enhance credibility by making these considerations visible to the reader up front. In addition, the listing of key assumptions would help the next level user in the analytical chain to be aware of possible inconsistencies in current work. At the present time, key assumptions necessary for the development of supporting calculations may not be traceable from the lower underpinnings to the next level of analysis.

5.5 Summary of Conditions Adverse to Quality

The audit team identified one deficiency during the audit that resulted in the issuance of DR LVMO-99-D-053; this is discussed in detail in section 5.5.2 below.

5.5.1 Corrective Action Requests

None

5.5.2 Deficiency Reports

DR LVMO-99-D-053

Thirteen TSPA "Work Direction and Planning Documents" were examined. It was found that some of these documents were not in compliance with the procedure AP-3.10Q, *Analyses and Models*. Specifically, section 5.1.1.c of the procedure states "Ensure the work direction addresses provisions for determining the accuracy, precision, and representativeness of the results associated with the analysis or model activity." Two of the planning documents examined did not address accuracy, precision, or representativeness of results. In addition, section 5.1.1.c.3 of AP-3.10Q requires a justification "for the model documentation requirements developed pursuant to this procedure in accordance with the second Note to paragraph 5.1.1.b." That note requires the Responsible Manager with the Lead/Supervisor to determine and justify the appropriate documentation requirements dependent on the complexity of the modeling or analysis activity. None of the work directions examined met this requirement.

5.5.3 Performance Reports

None.

5.5.4 Conditions Adverse to Quality Corrected During the Audit

None

6.0 RECOMMENDATIONS

Five recommendations to improve PA operations are submitted for management consideration. One through four are process recommendations and the fifth is an administrative recommendation; they are:

1. It would be desirable to have a TSPA Manual or document that clearly describes PA or provides an overview (i.e., a document describing the goals, objectives, interfaces, processes, elements, resources, etc. that comprise PA). Currently there are specific procedures that are utilized by TSPA for analyses, calculations, etc., but no overall document that flowcharts the process and depicts when and how these procedures are used. There are other resources used by TSPA to manage work that are not described anywhere either such as the workshops and technical exchanges. It is recommended that TSPA develop a guidelines manual (similar to the Mined Geologic Disposal System Design Control Guidelines Manual) that describes PA.

2. PA management should evaluate transparency and traceability issues associated with how "information" and "assumptions" are tracked and controlled within imbedded codes and "data" source description documents (including analyses). At least two major computer codes are imbedded in the RIP software; they are FEHM and SZ_CONVOLUTE. These have the potential of introducing transparency and traceability issues associated with key assumptions, quality of data, conceptual models, and uncertainties that are not visible to the next level of TSPA user.

3. PA management should assess any impact relative to levels of uncertainty. The level of uncertainty may not always be propagated through the entire system. A residual uncertainty may remain that is not addressed by the PA stochastic method. NRC acceptance criteria for evaluating data uncertainty (Criterion T2) and model uncertainty (Criterion T3) are described in the NRC, “Issue Resolution Status Report” (Key Technical Issue: Total System Performance Assessment and Integration), Revision 1, November 1998. This uncertainty issue is related to the use of alternative conceptual models, a question raised by the NRC Technical Observer during the audit.

4. PA management should consider the introduction of a master list of key assumptions and their level of impact to the dose results early in the TSPA document. This would enhance credibility by making these considerations visible to the reader/evaluator up front. In addition, the listing of key assumptions in the analytical chain would help the next level user to be aware of possible inconsistencies in current work. At the present time, key assumptions, necessary for the development of supporting calculations, may not be traceable from the lower underpinnings to the next level of analyses.

The key assumptions could be organized into the five subsystem components for the potential repository as defined by the NRC in Figure 1, Section 4.3, Total System Performance Assessment Methodology: Model Abstraction, of the "Issue Resolution Status Report" (Key Technical Issue: Total System Performance Assessment and Integration), Revision 1, November 1998. The five components are:

- Engineered Barriers,
- UZ Flow and Transport,
- SZ Flow and Transport,
- Direct Release and Transport, and
- Dose calculation.

These five subsystem components are upper tier categories for 14 key elements of subsystem abstractions, as defined by the NRC. Organizing the key assumptions of the TSPA into these five subsystem categories, early in the licensing documentation (the summary, perhaps), could have the benefit of facilitating the review by the NRC and other interested parties. The five subsystem categories could contain references to the 14 key elements of the subsystem abstractions to further organize and simplify any review.

5. There is a recommendation to closeout the PA QA Transition Plan developed in FY 98. It has been determined that the goals described in transition plan have been met. The usefulness of this document is over and a closeout of this document is recommended. Additionally, issues that were identified in the "Vertical Slice PA Report" need to be closed out. While some were addressed in the transition of PA to QA, some of the issues are being tracked by existing CARs. PA has committed to documenting the resolution to the issues that were addressed in the subject report.

7.0 LIST OF ATTACHMENTS

Attachment 1: Personnel Contacted during the Audit
Attachment 2: Summary Table of Audit Results

ATTACHMENT 1
PERSONNEL CONTACTED DURING THE AUDIT

Name	Organization/Title	Pre-audit Meeting	Contacted During Audit	Post-audit Meeting
Aguilar, R.	SNL, PA Staff		X	
Andrews, R	M&O/PA Operations Manager	X	X	X
Arnold,W.	SNL, PA SZ Flow Transport/ Biosphere Lead		X	
Baca, Robert	SNL, PA Technical Staff		X	
Barnard, R.	SNL, PA Technical Staff		X	
Burck, Peter	M&O, PA Technical Staff		X	
Benton, Hugh	M&O, Waste Package Operations Manager	X		
Bailey, Jack	M&O, Regulatory & Licensing Director	X		
Beall, Ken	M&O, Systems Engineering			X
Cruz, Betty	M&O, Systems Engineering	X		
Clark, J.K.	M&O/Deputy Assistant General Manager	X	X	X
Croft, Larry	M&O, Radiological/Environmental Programs	X		
Dana, Steve	OQA/QATSS Engineering Lead	X		
Dockery, Holly	SNL, Deputy PA Operations Manager		X	
Dunlap, B.	M&O, PA Staff		X	
Ehrhorn, T. F.	SNL, PA		X	
Eshleman, M.	OQA/QATSS	X	X	X
Francis, N.	SNL, PA Analyst		X	
Freeze, Geoff	M&O, PA		X	
Gauthier, J.	SNL, PA		X	
Gaither, K.	SNL, PA		X	
Graff, James	SNL OQA Lab Representative		X	
Greene, H.	OQA/QATSS Quality Systems Manager	X		X
Hayes, Larry	M&O/Manager, NEPO	X		X
Ho, Cliff	SNL, PA Natural Systems Performance Mgr		X	
Howard, Rob	M&O, PA EBS Performance Department	X	X	X
Howarth, S.	SNL/Performance Assessment		X	
Itamura, Mike	SNL, PA Technical Staff		X	
Kuzio, S.	SNL, PA Staff		X	
Lee, Joon	M&O, PA Lead/Waste Package Degradation		X	
Li, Chunhong	M&O, PA Scientist		X	
Mattie, Patrick	M&O, PA Technical Staff		X	
McKenzie, D.	M&O, Repository Design Manager	X		X
McNeish, J.	M&O, Total Systems Performance Manager	X	X	X
Miller, Steve	SNL, PA Staff		X	
Mueller, T.	M&O, Records Representative			X
Murthy, Ram	DOE/OCRWM OQA Quality Systems	X		

Name	Organization/Title	Pre-audit Meeting	Contacted During Audit	Post-audit Meeting
O'Connell, P	M&O, (DE&S) PA Engineer		X	
Opelski, Ed	OQA/QATSS Audit Lead	X		
Orrell, Andrew	SNL/Laboratory Lead		X	X
Pasupathi, P.	M&O, Waste Package Operations	X		X
Pelletier, John	SNL, Software Engineering	X		X
Peterson, D.	M&O(DE&S) PA Engineer		X	
Rechard, Rob	SNL, PA Analyst		X	
Schmitt, John	M&O, Radiological/Environmental Programs	X		
Segrest, Alden	M&O, Acting Deputy PA Manager	X	X	X
Sandifer, Bob	M&O, Site Construction & Operations Mgr.	X	X	X
Schelling, Joe	SNL, Engineering Assurance		X	
Smith, A.	M&O, PA Technical Staff		X	
Stockman, C.	M&O, Waste Package Operations	X		X
Stroupe, W.	M&O, Systems Engineering	X		
Swenning, S.	OQA/QATSS Quality Systems	X		X
Swift, Peter	SNL, PA		X	
Tait, Terry	M&O, Support Operations Manager			X
Wilkins, D.	M&O/ Assistant General Manager, Las Vegas	X	X	X
Touchstone, T.	M&O, Safety			X
Vallikat, Vinod	M&O, TSPA Implementation Lead		X	
Van Luik, Abe	OCRWM Licensing & Regulatory Compliance	X		X
Wagner, Lester	OQA/QATSS Verification Lead			X
Wilkins, Dan	M&O, AGM			X
Wilson, Mike	SNL, PA Staff		X	
Wikjord, A.	DOE Consultant (AECL)	X	X	X
Wolverton, K.	M&O, Radiological/Environmental Programs		X	
Wemheur, R.	M&O, NEPO	X		
Younkers, J.	M&O/Deputy AGM- Technical	X	X	

Legend:

AGM	Assistant General Manager
NEPO	Natural Environmental Programs Operation
QATSS	Quality Assurance Support Services
AECL	Atomic Energy of Canada Limited

ATTACHMENT 2
SUMMARY TABLE OF AUDIT RESULTS
Performance Assessment Operations

Process Steps	Details (Checklist)	Deficiencies	Recommendations	Process Effectiveness	Overall
Identification of TSPA goals & objectives	p.2, item 1,3		Rec. #1, 5	SAT	SAT
Identification of Regulatory Requirements: NRC, DOE, EPA	p.3, item 4 p.15, item 64			SAT	SAT
PA Planning	p.2, item 1,3 p.10, item 38 p.15, item 64-67	LVMO-99-D-053	Rec. #1, 5	UNSAT	SAT
Resources:					
Prerequisites Management, Logistics, Personnel, equipment	p.3, item 6,7 p.16, item 67		Rec. #1,	SAT	SAT
Methodology:					
Protocols, (procedures) Assumptions, Data (acquisition, categorization, data reduction) Analyses, Products (models, reports, design input)	p.2, item 3 p.3, item 7 pp.4-15, items 8-63, pp.16-19, items 68-79	LVMO-99-D-053 (re: procedure violation)	Rec. #2- 4	SAT	SAT
Adequacy & Accuracy:					
Reviews (internal, external) Evaluations	p.7, item 27 p.4, item 13 p.5, item 17 p.18, item 74			SAT	SAT
Interfaces:					
Internal (science organizations, engineering, client) External (US NRC)	p.2, item 2 p.4, item 8, 11 p.16, item 65		Rec. #1, 5	SAT	SAT
Deliverables:					

Process Steps	Details (Checklist)	Deficiencies	Recommendations	Process Effectiveness	Overall
Analyses, Models, Reports, Design, Records	p.3, item 5 p.7, item 25 p.7, item 28 p.9, item 36			SAT	SAT
TDMS PROCESS (Overall implementation)					SAT

LEGEND:

SAT……. Satisfactory
UNSAT……Unsatisfactory